substrate comprising a transparent polymer carrier layer bearing indicia formed from a plurality of opaque and non-opaque regions and a clear transparent magnetic layer supported by the carrier layer containing a distribution of particles of a soft magnetic material of a size and distributed in a concentration at which the magnetic layer remains clear and transparent.

The advantage of using a clear magnetic layer means that this type of magnetic feature can be incorporated into existing designs of security elements (threads) without affecting their visual appearance. This avoids the need to retrain the public and other handlers in recognition of the security features of security documents incorporating such elements. It thus allows for a seamless introduction of a magnetic feature, without the need to withdraw existing security documents. Both variations, with and without the magnetic feature, can be used side by side without confusion occurring.

Additionally, counterfeiters are not likely to be aware of the existence of the transparent magnetic features and therefore are less likely to try to include one in any counterfeits, thus making it easier to detect counterfeits.

A preferred embodiment of the present invention will now be described by way of example only, with reference to the accompanying drawings in which:-

Figures 1, 2, and 3 are cross-sectional side elevations of a substrate according to the present invention;

shown in Figure 20 but with the print features located within the demetallised region;

Figures 28 to 35 are cross-sectional side elevations of further alternative substrates incorporating optically variable devices;

Figure 36 is a cross-sectional side elevation of an alternative substrate to that of Figure 2, but with two demetallised layers, one on either side of the transparent magnetic media containing layer; and

Figures 37 and 38 are cross-sectional side elevations of further alternative substrates which are coded.

The present invention makes use of transparent magnetic materials that are now available from a number of suppliers. In the most basic form such transparent magnetic media comprises a polymeric film in which have been suspended magnetic particles of a soft magnetic material. The particles themselves are not colourless, but the degree of concentration is such as to allow the polymeric film to remain clear and transparent. Various other forms of transparent magnetic media are described in the prior art any of which would be suitable for the present application. In particular, the wider the thread, the lower the concentration of magnetic particles is required for accurate machine detection, due to the fact that the signal recovery is considerably differentiated from the normal cash processing system noise.

Figures 1 and 4 illustrate two embodiments of a substrate according to the present invention. In Figure 1 the substrate comprises a transparent polymer carrier layer (1) and a clear transparent, magnetic layer (2)

formed from magnetic particles which are suspended in a varnish which is printed or coated onto the carrier layer (1). The size and distribution of the particles is controlled so that the thickness of the magnetic layer (2) is irrelevant. The size of the particles may vary for different materials, examples of which are listed below. Although larger particles of these magnetic materials are lighter than smaller particles, the size must also be selected to enable painting or coating of the varnish containing the particles.

The invention requires the use of soft magnetic materials, namely those which have little or no magnetic remanence in the absence of an applied magnetic field, and preferably a coercivity of less than 100 oersteds, and more preferably less than 50 oersteds.

Suitable magnetic material included iron, iron carbonyl, nickel, cobalt and alloys of theses, such as a 50:50 alloy of Fe:Co, Permalloy(tm)(Ni:Fe, PC) or MuMetal (tm) (Ni:fe), Iron:phosphorus. Suitable materials must have a sufficiently high saturation magnetisation. Flake nickel materials can be used with surprising advantages. These materials have a small coercivity and a highly detectable remanence, and still give a transparent film. As is well known, the thinner and more flake like the particles, the greater the anisotropy and therefore the resulting covercivity and remanence. The remanence is high enough to be detectable on inductive machine read heads, which are the older more well known machines, without the need for the newer magnet-resistive heads.

Suitable varnishes include 1462 from Luminescence, VHL 31534 from Sun Chemicals or 31833XSN, 20784XSN and 90838XSN, all from Coates

CLAIMS:

1. A security substrate comprising a transparent polymer carrier layer bearing indicia formed from a plurality of opaque and non-opaque regions and a clear transparent magnetic layer supported by the carrier layer containing a distribution of particles of a soft magnetic material of a size and distributed in a concentration at which the magnetic layer remains clear and transparent.

2. A security substrate as claimed in claim 1 in which the transparent magnetic layer comprises a varnish in which are suspended the magnetic particles.

3. A security substrate as claimed in claims 1 or 2 in which the transparent magnetic layer lies between the carrier layer and the indicia.

4. A security substrate as claimed in any one of the preceding claims in which the indicia are formed on the carrier layer and the transparent magnetic layer covers the indicia.

5. A security substrate comprising a clear transparent polymer carrier layer, bearing indicia formed from a plurality of opaque and non-opaque regions, which carrier layer contains a distribution of particles of a soft magnetic material of a size and distributed in a concentration at which the carrier layer remains clear and transparent.

6. A security substrate as claimed in any one of the preceding claims further comprising an additional layer of a transparent polymer laminated to the magnetic layer and/or indicia.

regions.

16. A security substrate as claimed in any one of the preceding claims further comprising an optically variable device.

17. A security substrate as claimed in claim 16 in which the optically variable device is formed by embossing a layer of embossing lacquer.

18. A security substrate as claimed in claim 16 in which the embossing lacquer lies between the magnetic layer and the indicia.

19. A security substrate as claimed in claim 17 in which the embossing layer lies between the transparent magnetic layer and a layer of high refractive index.

20. A security substrate as claimed in claim 17 wherein the embossing layer overlies the indicia.

21. An elongate security element made by the step of slitting the substrate as claimed in any one of the preceding claims in register with the indicia.

22. A security document comprising a paper or polymer substrate incorporating a security thread as claimed in claim 21.

23. A security substrate substantially as hereinbefore described with reference to and as shown in the accompanying drawings.